United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: ● Original 0-10 ○ Amendment

Contract Number	Contract Period	SF Site Name:
EP-C-09-027	Base: 4/1/09 - 3/31/10 Option Period No.	

Title of Work Assignment: Hg Measurements Laboratory and Field Testing

Suggested Source: ARCADIS	Specify Section & Paragraph of Contract SOW: 1.8, 2.0A, 4.3, 5.2, 6.0D, 7.0
Purpose: ● Work Assignment Initiation ○ Work Assignment Close-Out ○ Work Assignment Amendment ○ Incremental Funding ○ Work Plan Approval	Period of Performance From: To: 4/1/09 - 3/31/10
Comments:	QA Category (check one) ○ I Enforcement ○ II Standard Sampling ● III Technology Development ○ IV Proof of Concept ○ N/A

Note: To report additional accounting and appropriations data use EPA Form 1900-69A

SFO 22 (Max 2) Superfund ○ Non-Superfund

Accounting and Appropriations Data

	DCN (Max 6)	Budget/FYs (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount	Sites/Project (Max 8)	Cost Org/Code (Max 7)
1									
2									
3									
4									
5									

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee	LOE
Previously Approved	New	0
This Action		2691
Total:		2691

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Jeff Ryan	Branch / Mail Code: APTB / E305-01
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Branch Chief Name: Robert E. Hall, Chief, APTB	Branch/Mail Code: APTB / E305-01
(Signature) Robert E. Hall 3/18/09 (Date)	Phone Number: (919) 541-2477
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Project Officer Name: Diane L. Pierce	Branch/Mail Code: /
(Signature) Diane L Pierce 3/20/09 (Date)	Phone Number: 919-541-2708
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Contracting Official Name: Renita Tyus	Branch/Mail Code: CPOD
(Signature) Renita Tyus 3/31/09 (Date)	Phone Number: 513-487-2094
	Fax Number: 513-487-2109
Contractor Acknowledgement of Receipt and Approval of Workplan (Signature and Title)	Date

Work shall not begin until 4/1/09

Statement of Work
for
Hg Measurements Laboratory and Field Testing

Project Description:

A number of critical technical issues associated with Hg monitoring remained unresolved, including establishment of suitable NIST-traceable gases for elemental and oxidized Hg, and verification QA/QC procedures, techniques, and verified performance criteria for sorbent trap monitoring systems. Continued support to OAR is needed to resolve these technical issues.

The development of NIST- traceable Hg Gas Standards of known and accepted concentrations is critical to the implementation of Hg CEMs for regulatory applications and is still far from being finalized. Currently available Hg gas standards, both elemental and oxidized, do not meet these requirements. EPA is working with NIST to identify and verify equipment and techniques suitable for establishing NIST traceability. Additional laboratory and field testing is needed to develop and evaluate candidate approaches, primarily to determine their true concentrations, but also to support NIST's efforts to establish NIST traceability. This WA will be used to perform laboratory and field testing of various Hg gas standard technologies that will be used to develop the necessary data and procedures so that NIST Traceability Protocols can be developed and made available for industry use.

The use of sorbent traps for RM applications has matured to the extent that they are now widely used, largely driven by the relatively low cost of their use. This practicality and low cost makes them viable tools for efficiently establishing emission inventories for developing countries. However, the current approach only measures total Hg. A speciating technique would enable a more comprehensive measurement. It may be possible to adapt the existing method for speciated measurements. This WA will be used to perform laboratory and field testing of candidate trap materials to determine if a viable speciating approach can be developed.

Reliable, speciated Hg measurements are important for multiple emissions characterization purposes. Such measurements are particularly important, yet increasingly complicated, in high PM environments (e.g., upstream of an SCR or ESP). Hg CEMs equipped with inertial probes have been applied in these environments as well as post pollution control environments. However, the quality of these measurements has yet to be verified. Independent techniques such as the FUME method, can be used to verify measurement quality. This WA will be used to perform pilot-plant testing to evaluate approaches for assessing the quality if speciated Hg measurements.

Considerable information and data must be disseminated to facilitate and enable implementation of the CAMR. Additional supporting data and information must also be documented in the form of field test and final reports. This WA will be used to prepare a number of these important documents.

This WA is a continuation of WA (4-039), Contract EP-C-04-023

Statement of Work:

TASK 1. Work Plan, Reporting, Budget, And WA Management

The contractor shall prepare and deliver to the WA manager (WAM) a work plan and budget within 15 days of WA effective date. The work plan must include a description of how the contractor shall accomplish each task, along with a breakdown of; level of effort by professional level per task; a cost breakdown per task, and any underlying assumptions used. The contractor shall conduct activities necessary to manage the WA, including at least weekly communication with the EPA WAM.

TASK 2. Preparation of New WA QAPP

The contractor shall prepare and deliver a new WA QAPP. The QAPP shall be developed according to the requirements in Appendix #1 to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

TASK 3. Testing of Hg Gas Standards to Support NIST Traceability

Procedures, techniques, and equipment (if necessary) shall be identified, developed, and demonstrated through laboratory and field testing that will determine the concentrations of various, available Hg gas standards, including, but not limited to: compressed gas cylinders, vapor pressure elemental Hg gas generators (Thermo 81i, Tekran 3310, PSA CavKit), and oxidized ($HgCl_2$) gas generators (the HOVACAL $HgCl_2$ generator, the Tekran 3315 $HgCl_2$ generator and the Thermo $HgCl_2$ generator). The overall objective of this task is to develop equipment, procedures, and data that will be used by NIST and EPA to develop the necessary NIST Traceability Protocols for Hg gas standards. Several sub-tasks have been identified:

1) The contractor shall evaluate each generator for total and speciated Hg using standard techniques as well as suitable Hg monitors. Consideration shall be given to developing a simple, yet reliable, total and speciating laboratory Hg monitor (e.g., Thermo 80i w/SnCl2 reactor) capable of accurately evaluating the oxidized Hg gas standards. It is anticipated that this work will involve communication with representatives from NIST to ensure that methods are consistent and useful. (Target deliverable June 30, 2009)
2) The contractor shall conduct comparison testing of available Hg^0 generators using NIST's bracketing procedure so as to derive the uncertainty of specific concentrations for each generator. The ultimate goal is to determine the current level of transferred uncertainty capable under laboratory conditions. The contractor shall also investigate issues associated with calibration uncertainty and finalization of the EPA traceability protocol, including prequalification requirements, variables contributing to uncertainty, and data reduction spreadsheets. (Target deliverable August 31, 2009)
3) The contractor shall conduct experiments to further characterize the fundamental differences between NIST traceable solution HgCl2 generators and Hg0 generators. Initially, the contractor shall consider the use of carbon sorbent traps and multiple analytical techniques to

characterize this discrepancy. Close coordination with NIST shall be required. (Target for initial deliverable July 31, 2009)

4) The contractor shall contribute to the preparation/finalization of the intended NIST traceability protocols, including preparation of data reduction and reporting spreadsheets, as identified in writing by the WAM. (Target deliverable February 28, 2010)

TASK 4. Sorbent Trap Reference Method Field Testing

The contractor shall conduct laboratory and field testing to evaluate potential speciating sorbent traps. Specific focus shall be placed on the level of performance achieved while conducting the Field Recovery Test component of the RM. Field Recovery Tests shall be conducted in replicate under varied conditions with multiple sorbent trap materials and shall be limited to analysis by the Thermal Analysis (Lumex) technique. The contractor shall anticipate travel to at least 2 field test sites. Several sub-tasks have been identified:

1. The contractor shall perform laboratory tests to determine the acceptable upper temperature range that speciated traps can be used. These tests shall include approaches to mitigate temperature effects, including air-cooled probes. (Target 5/31/09)
2. The contractor shall perform proof of concept testing on the MPCRF demonstrating the performance of the air-cooled probes. (Target 7/31/09)
3. The contractor shall perform field testing using quad probes, preferably in a high temperature environment, to demonstrate the speciated measurement quality (Target 10/31/09)

TASK 5. Speciated Measurement Quality Testing

The contractor shall develop and evaluate approaches suitable for assessing the speciated Hg measurement quality of APTB's Hg CEMs associated with MPCRF operations. Approaches shall include as a minimum probe floods and dynamic spiking with elemental and oxidized hg gas standards as well as independent, reliable elemental Hg measurements such as FUME. (Target 6/30/09)

TASK 6. Other Tests as Identified

The contractor shall perform additional tests identified in writing by the EPA WAM. Examples of such tests include, but are not limited to: characterization of HOVACAL feed solution stability, parameters affecting sample flow for dilution systems, effect of moisture on elemental Hg reactivity.

TASK 7. Draft and Final Reports

Several data reports are required as a function of this WA. Known reports include, but are not limited to: Field Test Reports for field testing activities, Standard Operating Procedures (SOPs) for Thermal analysis by Lumex analyzer, the spiking of sorbent traps, calculation of Field Spike recoveries for existing sorbent traps according to Method 18 procedures. A report describing the

Gas Standard testing is the primary product. Finalization and reporting requirements for these and new research efforts will be requested in writing by the WAM. (Multiple target dates)

Reports of Work:

The contractor shall prepare a work plan and budget as described in Task 1 within 15 days of WA effective date. The contractor shall prepare and submit monthly reports in accordance with the terms and conditions of the contract.

Health and Safety Protocols shall be prepared and submitted for approval as required by contractor, APPCD, and SHEM safety personnel.

A Test Plan documenting the Hg Gas Standard testing shall be prepared as an addendum to the new WA QAPP.

The contractor shall prepare the reports identified in Task 7

The contractor shall maintain at least weekly communications with the WAM. Additionally the contractor shall inform the PO and the WAM in writing when 75% of the total funds and/or hours contained in the work plan are expended.

ATTACHMENT #1
TO THE STATEMENT OF WORK

NRMRL QA Requirements and Definitions

EPA=s Quality System Website: http://www.epa.gov/quality/

EPA=s Requirements and Guidance Documents:
http://www.epa.gov/quality/qa_docs.html

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The QAPP shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

Definitions:

Environmental Data - These are any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, that are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization=s/program=s quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization=s/program=s QMP shall address all elements listed in the ARequirements for Quality Management Plans@ in Appendix B of the NRMRL QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

□ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

Category Level Designations (determines the level of QA required):

□ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in R-5.

□ **Category II Project** - applicable to studies performed to generate data used in

support of the development of environmental regulations or standards. The QAPP shall address all elements listed in R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of R-5, as outlined in the NRMRL QAPP requirements for the specific project type (see below).

X **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of R-5, as outlined in the NRMRL QAPP requirements for the specific project type (see below).

Guidance for QAPPs by Project Type (described in more detail on subsequent pages):

These outlines of NRMRL QAPP Requirements for various project types, from Appendix B of the NRMRL QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario, and QAPPs must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. Additional guidance is given in "QAPP Requirements for Applied Research Projects".

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. Additional guidance is given in "QAPP Requirements for Basic Research Projects".

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to engineering projects involving environmental technologies, an all inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environment. Comprehensive guidance can be found in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/qs-docs/g11-final-05.pdf.

X **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. Additional guidance is given in "QAPP Requirements for

Method Development Projects@ .

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. Additional guidance is given in AGuidance for Quality Assurance Project Plans for Modeling@ G-5M, http://www.epa.gov/quality/qs-docs/g5m-final.pdf. Abbreviated guidance is provided in AQAPP Requirements for Research Model Development and Application Projects@.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. Additional guidance is given in AQAPP Requirements for Sampling and Analysis Projects@.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. Additional guidance is given in AQAPP Requirements for Secondary Data Projects@.

QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

A method development project is typically needed in situations for which there exists no standard or known method, or when an existing method needs to be modified to meet a project-specific need. The following requirements should be addressed as applicable.

SECTION 1.0, BACKGROUND

A description of the situation that requires the generation of a new or modified method shall be clearly stated. *Why are we doing this?*

SECTION 2.0, SCOPE AND APPLICATION

The scope and application of the method shall be clearly stated. Specifically, to what matrices, conditions, *etc.*, will this method apply for this project? What detection limits and/or practical quantitation limits are needed? How is this method intended to be used in the future (*e.g.*, research only, potential regulatory usage, *etc.*)?

SECTION 3.0, PROJECT ORGANIZATION

Responsibilities of all project participants shall be identified, meaning that key personnel and their organizations shall be identified, along with the designation of responsibilities for planning, coordination, sample collection, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation (independent of data generation), data analysis, report preparation, and quality assurance.

SECTION 4.0, EXPERIMENTAL APPROACH INCLUDING SAMPLING AND ANALYTICAL SPECIFICATIONS

4.1 A description of the test(s) to be conducted in order to support the development of the method shall be included. All known or preestablished test conditions and variables shall be provided.

4.2 All planned measurements (*i.e.*, analytical [chemical, microbiological, assays, *etc.*], physical, and process) shall be identified, and project-specific target analytes shall be listed.

4.3 Any known restrictions/specifications for sampling (*e.g.*, collecting soil samples from a site or water samples from a port, *etc.*) or subsampling (*e.g.*, mixing sample before taking subsample for analysis, *etc.*) shall be documented. Include specifications for: type and size of sample containers; amount of sample needed for preparation and analysis; preservation; holding times; representativeness; compositing; QC samples; *etc.*

4.4 The type of instrumentation that will be used and any required instrument

conditions shall be documented. Include a discussion of calibration and calibration verification including frequency, acceptance criteria, and corrective action to be taken if acceptance criteria are not met.

SECTION 5.0, QA/QC CHECKS

Any planned QC checks and criteria that must be met for the method to be considered successful shall be specified. QC checks may include spikes, replicates, blanks, controls, surrogates, *etc.*

Note: For chemical methods, quality control procedures to determine the precision, accuracy, and method detection limit should be described. For microbiological methods, positive and negative control procedures should be described.

SECTION 6.0, METHOD VERIFICATION

The tests that will be used to verify the method=s performance once it=s been developed shall be specified.

SECTION 7.0, REPORT

The report for a successful method development project will be a method written in a format appropriate for the application *e.g.*, SW-846 for RCRA applications, Standard Methods for bacteria in drinking water, a SOP for a specific application (with supporting method performance data appended), *etc.*

SECTION 8.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.